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A cyclopoid copepod, *Sewellochiron fidens* n. gen., n. sp., associated with a medusa in Puerto Rico

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ABSTRACT

A new lichomolgid copepod, *Sewellochiron fidens* n. gen., n. sp., is described from Puerto Rico, where it is associated with the medusa *Cassiopea xamachana.*

INTRODUCTION

Only a few copepods are known to be associated with scyphozoan medusae. Humes (1953) reported a new harpacticoid species, *Nitocra medusaea,* from small pits in the exumbrella of *Aurelia* sp. at Portsmouth, New Hampshire. Reddiah (1968) described three new cyclopoid species of the genus *Paramacrochiron* Sewell, 1949, from medusae in southeastern India. These are *P. ennorense* from unidentified medusae, *P. sewelli* from *Lychnorhiza malayensis* Stiasny, and *P. rhizostomae* from *Rhizostoma* sp. Recently Reddiah (1969) has described a new genus and species, *Pseudomacrochiron stocki,* from *Dactylometra quinquicirrha* L. Agassiz at Madras, India. All of Reddiah's specimens were recovered from washings of medusae relaxed with menthol, and the exact location of the copepods on the hosts is not known. The new copepod described here was obtained after washing the medusae in slightly alcoholized sea water.

The figures have been drawn with the aid of a camera lucida. The letter after the explanation of each figure refers to the scale at which it was drawn. The abbreviations used are: R = rostrum, A_1 = first antenna, A_2 = second antenna, L = labrum, MXPD = maxilliped, and P_1 = leg 1.

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Family Lichomolgidae Kossmann, 1877

Sewellochiron n. gen.

Body cyclopiform. Rostrum rounded rather than pointed. First antenna 7-segmented. Second antenna 3-segmented, the last segment with one claw, an almost clawlike seta, and five simple setae. Labrum with two posteroventral lobes. Mandible with a scalelike area on the convex edge of the base, flagellum long. Paragnath a simple lobe. First maxilla with four setae. Second maxilla 2-segmented. Maxilliped of the female 3-segmented, that of the male 4-segmented with one claw.

Both rami of legs 1 to 3 three-segmented. Exopod of leg 4 three-segmented, the last segment armed with III,I,5. Endopod of leg 4 a single short segment (showing an incomplete transverse crease) armed with two terminal spines. Leg 5 with a free segment bearing terminally a spine and a seta. Male with sexual dimorphism in the last segment of the endopod of leg 1 where the formula is I,I,4.

Near *Paramacrochiron* and *Pseudomacrochiron*.

Other features as in the species described below.

Associated with scyphozoan medusae.

Type and only known species: *Sewellochiron fidens* n. sp.

Gender neuter.

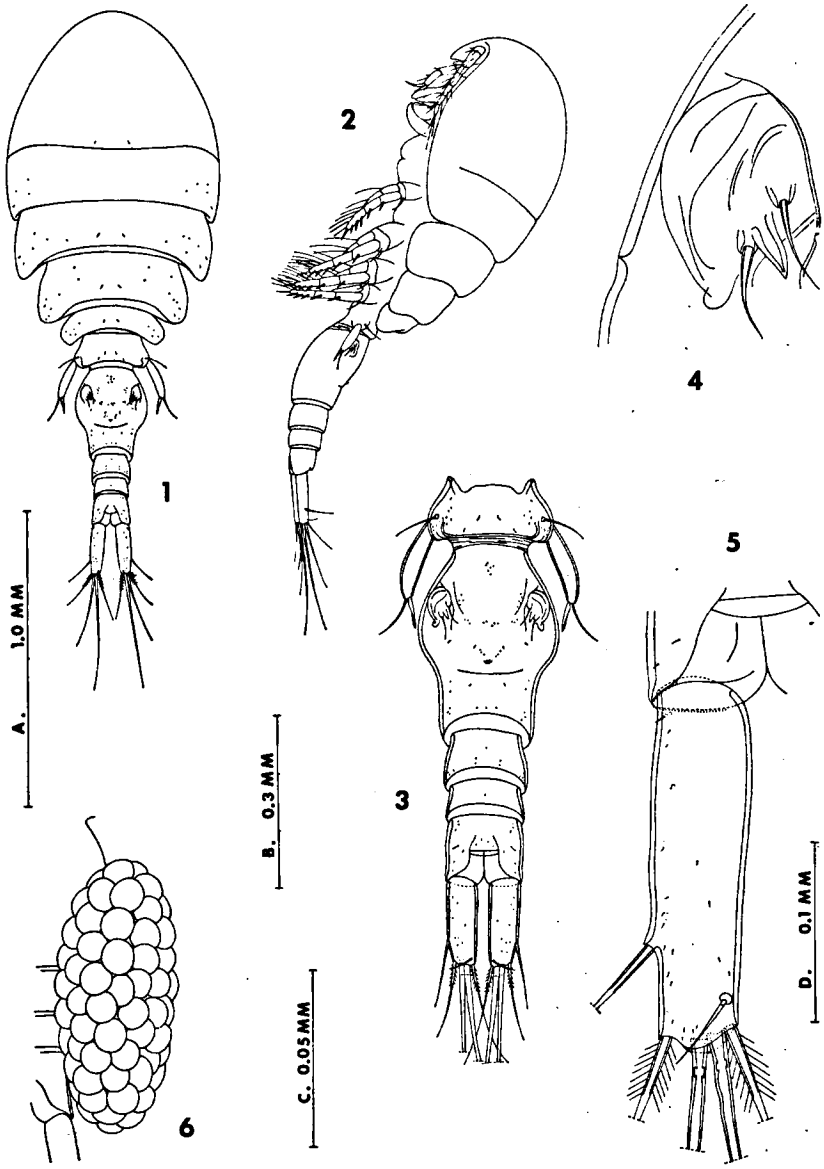
The name is a combination of Sewell (for the late R. B. Seymour Sewell) and -chiron, derived from the Greek word χείρ = a hand or claw and used in names of related genera.

Sewellochiron fidens n. sp. Figs. 1—27

Type material. — 83 ♀♀ and 42 ♂♂ from 114 *Cassiopea xamachana* R. P. Bigelow[1]), in 3 m, Cayo Enrique, south of La Parguera, southwestern Puerto Rico, August 18, 1959. Holotype ♀, allotype, and 70 paratypes (47 ♀♀, 23 ♂♂) deposited in the Zoölogisch Museum, Amsterdam (ZMA Co. 101,156); 30 paratypes (20 ♀♀, 10 ♂♂) in the United States National Museum, Washington; and the remaining paratypes in the author's collection.

Female. — The body (figs. 1 and 2) is cyclopiform. The length (excluding the setae on the caudal rami) is 1.84 mm (1.78—1.95 mm) and the greatest width 0.69 mm (0.67—0.70 mm), based on 10 specimens in lactic acid. The ratio of the length to the width of the prosome is 1.51 : 1. The segment of

[1]) The spelling *Cassiopea*, rather than *Cassiopeia*, follows that of Kramp (1961).



FIGURES 1—6. *Sewellochiron fidens* n. gen., n. sp., female. 1, dorsal (A); 2, lateral (A); 3, urosome, dorsal (B); 4, area of attachment of egg sac, dorsal (C); 5, caudal ramus, dorsal (D); 6, egg sac, with edge of urosome, dorsal (B).

leg 1 is separated from the head dorsally and laterally by a furrow. The epimeral areas of the metasomal segments are rounded.

The segment of leg 5 (fig. 3) is 96 × 247 μ. Between this segment and the genital segment there is no ventral intersegmental sclerite. The genital segment is elongated, 319 μ long, in dorsal view its anterior two-thirds expanded laterally with rounded margins (greatest width 231 μ) merging gradually with the more slender posterior third (width here 154 μ). Mid-dorsally near the junction of the expanded and narrow parts of the segment there is a transverse crease in front of which there is a small crescentic sclerotization which protrudes slightly in lateral view (fig. 2). The areas of attachment of the egg sacs are dorsolateral in position, each area (fig. 4) bearing two naked setae about 25 μ long with a spiniform process 17 μ between them. The three postgenital segments are 83 × 135 μ, 57 × 125 μ and 104 × 133 μ from anterior to posterior. The anal segment has a row of minute spinules posteriorly on its dorsolateral and ventrolateral margins.

The caudal ramus (fig. 5) is elongated, 200 × 53 μ in greatest dimensions. The ratio of the length to the width is 3.77 : 1. The outer lateral seta is 130 μ and the dorsal pedicellate seta is 41 μ, both of them naked. The outermost terminal seta is 135 μ and the innermost terminal seta 160 μ, both haired proximally. The two long median terminal setae are 275 μ (outer) and 390 μ (inner), both naked and inserted between dorsal (smooth) and ventral (with a row of minute spinules) flaps. The longer of these two setae shows a weak joint at about mid-length. There is a minute lateral setule 5 μ long on the outer proximal area of the ramus. The dorsal and ventral surfaces of the ramus bear very small hairs.

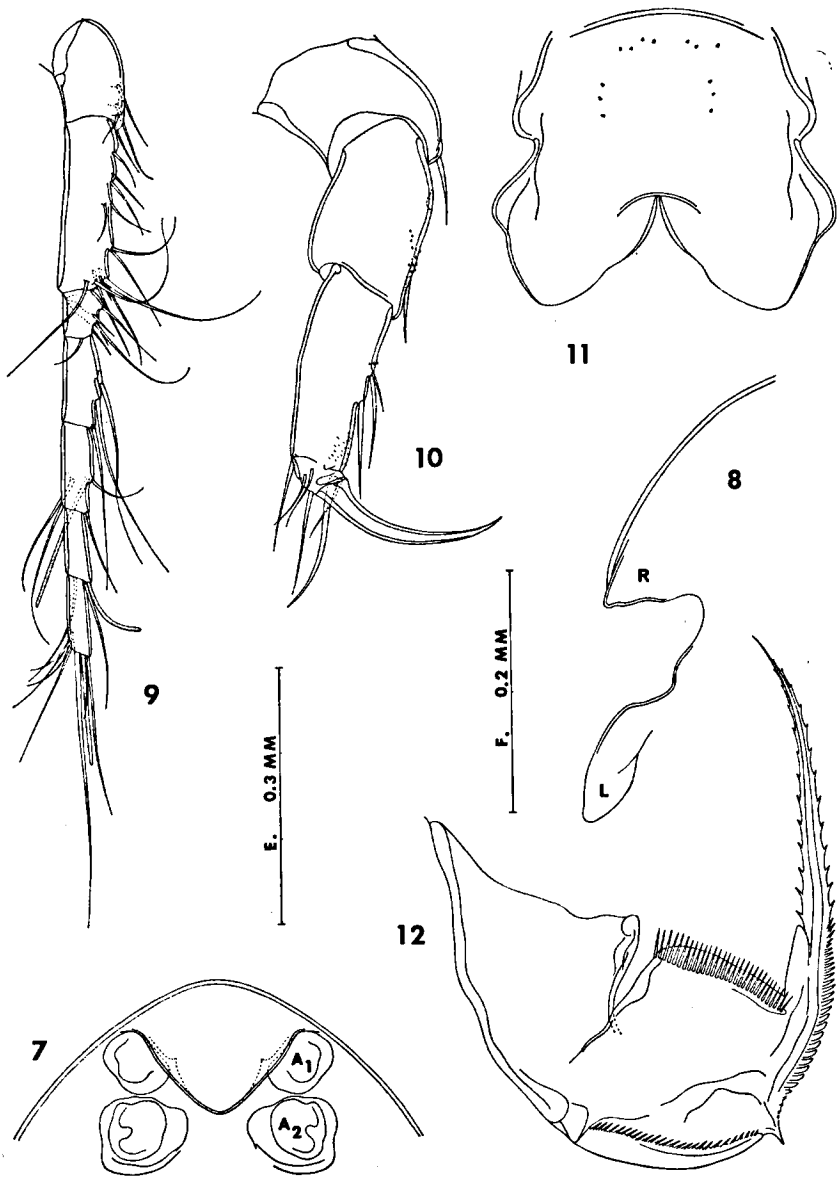
The dorsal surface of the prosome and urosome bears minute hairs (sensilla) and refractile points; the ventral surface of the urosome is somewhat less ornamented. The ratio of the length of the prosome to that of the urosome is 1.33 : 1.

The egg sac (fig. 6) is elongated oval, 451 × 215 μ, reaching just posterior to the insertion of the caudal ramus and containing numerous eggs each about 52 μ in diameter.

The rostrum (fig. 7) is broadly triangular with a rounded tip. In lateral view (fig. 8) the rostrum is raised ventrally and is pointed rather than rounded.

The first antenna (fig. 9) is 7-segmented, 500 μ in length. The lengths of the segments (measured along their posterior non-setiferous margins) are: 39 (88 μ along the anterior margin), 133, 33, 66, 66, 50, and 60 μ respectively. The formula for the armature is: 4, 13 (5 + 8), 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete, as often seen in lichomolgids. The long terminal seta is 180 μ. All the setae are naked.

The second antenna (fig. 10) is 3-segmented, with the third segment resulting from the apparent complete fusion of the original third and fourth segments. The first segment bears one seta and the second bears one seta and a few minute spinules. The third segment, 107 μ along its outer edge to the



FIGURES 7—12. *Sewellochiron fidens* n. gen., n. sp., female. 7, rostrum, ventral (E); 8, profile of rostrum (R) and labrum (L), lateral (F); 9, first antenna, dorsal (F); 10, second antenna, anterior (D); 11, labrum, ventral (D); 12, mandible, posterior (C).

seta, 94 μ along its inner edge, and 40 μ wide, bears on its inner margin three setae and a few very small spinules and is armed terminally with a recurved claw 101 μ along its axis and six setae, one of them stouter than the others and almost clawlike. All the setae are naked.

The labrum (fig. 11) has two divergent hyaline posteroventral lobes.

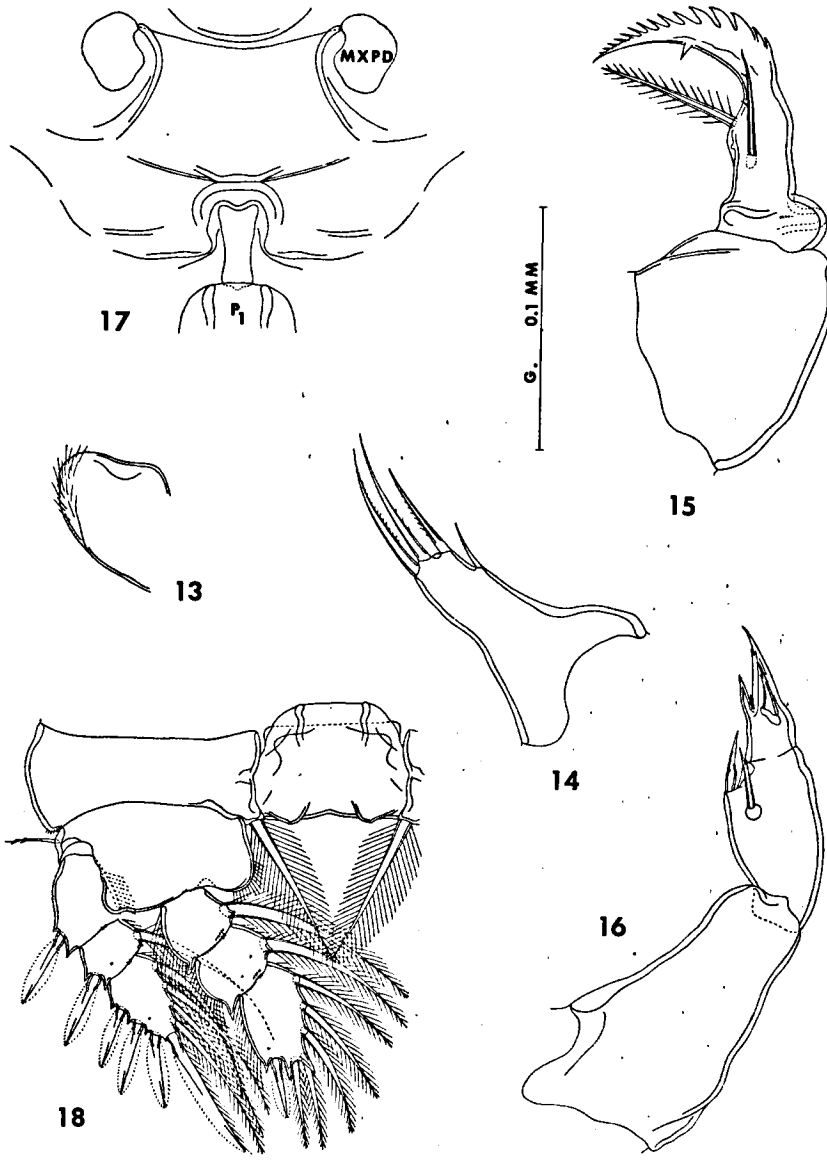
The mandible (fig. 12) has on the convex side of the blade a scalelike region with a row of spinules, followed by a hyaline spike, and then by a row of toothlike serrations. The concave margin is deeply incised, with the margin distal to the incision having a row of spinules. The long flagellum has barbed hyaline lamellae. The paragnath (fig. 13) is a small hairy lobe. The first maxilla (fig. 14) has four setae. The second maxilla (fig. 15) has a large unornamented first segment. The second segment, with a rather swollen base, bears a minute proximal outer spinule, a posterior surficial seta with only two inner spinules, and a strongly barbed inner seta; the terminal lash is rather short, with teeth along the convex margin and a single spine in the middle of the concave margin. The maxilliped (fig. 16) is probably 3-segmented though the second, third segments are indistinctly separated. The first segment is unarmed, the second bears two inner spines, one naked, the other with a minute spinule. The third segment bears subterminally an articulated spine with one spinule, a small setule, and a spine without an articulation; terminally the segment is prolonged as a spiniform and almost clawlike process with one inner spinule.

The area between the maxillipeds and the first pair of legs (fig. 17) is somewhat protuberant (fig. 2); a sclerotized line connects the bases of the maxillipeds.

Legs 1 to 4 (figs. 18, 19, 20, and 21) have 3-segmented rami, except for the endopod of leg 4 which consists of a single segment. The armature is as follows (the Roman numerals indicating spines, the Arabic numerals representing setae):

P_1	coxa	0—1	basis	1—0	exp	I—0	I—1	III,I,4
					enp	0—1	0—1	I,5
P_2	coxa	0—1	basis	1—0	exp	I—0	I—1	III,I,5
					enp	0—1	0—2	I,II,3
P_3	coxa	0—1	basis	1—0	exp	I—0	I—1	III,I,5
					enp	0—1	0—2	I,II,2
P_4	coxa	0—1	basis	1—0	exp	I—0	I—1	III,I,5
					enp	II		

The inner seta on the coxa of legs 1 to 3 is long and plumose, but in leg 4 this seta is shorter (84 μ) and finely barbed. The inner margin of the basis in all four legs is haired. The exopod of leg 4 (fig. 21) is 280 μ long, and the endopod 125 μ, the ratio being 2.24 : 1. The endopod is considered to be 1-segmented, though the wider proximal half (width 44 μ, with hairs on both inner and outer margins) and the narrower distal half (width 40 μ, with hairs only on the outer margin) are set off from one another by an outer indentation and an incomplete transverse crease on the anterior surface of the segment. The two terminal fringed spines are 72 μ (outer) and 98 μ (inner). At the insertion of each spine there is a row of minute spinules.



FIGURES 13—18. *Sewellochiron fidens* n. gen., n. sp., female. 13, paragnath, posterior (C); 14, first maxilla, posterior (C); 15, second maxilla, posterior (G); 16, maxilliped, antero-inner (G); 17, area between maxillipeds and leg 1, ventral (F); 18, leg 1 and intercoxal plate, anterior (F).

Leg 5 (fig. 22) has a long unornamented free segment of somewhat irregular form, about 130 × 35 μ in greatest dimensions. Terminally it bears an outer naked seta 64 μ and an inner spine 55 μ, with its outer side having a proximal swelling and a distal lamella. The seta on the body near the free segment is naked.

Leg 6 is probably represented by the two setae near the attachment of each egg sac (fig. 4).

The color in life in transmitted light is slightly opaque, the eye red.

Male. — The body (fig. 23) resembles in general form that of the female. The length (not including the ramal setae) is 1.43 mm (1.28—1.50 mm) and the greatest width 0.47 mm (0.45—0.50 mm), based on 10 specimens in lactic acid. The ratio of the length to the width of the prosome is 1.55 : 1.

The segment of leg 5 (fig. 23) is 65 × 146 μ. Between this segment and the genital segment there is no ventral intersegmental sclerite. The genital segment is 286 × 270 μ, only a little longer than wide. The four postgenital segments are 70 × 99 μ, 52 × 91 μ, 34 × 83 μ, and 65 × 86 μ from anterior to posterior.

The caudal ramus resembles that of the female, but is smaller, 143 × 44 μ.

The body is ornamented with minute hairs and refractile points as indicated in figure 23. The ratio of the length of the prosome to that of the urosome is 1.07 : 1.

The rostrum is like that of the female.

The first antenna is similar to that of the female, but three long aesthetes are added (fig. 23), two on the second segment, and one on the fourth segment, so that the formula is: 4, 13 + 2 aesthetes, 6, 3 + 1 aesthete, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete.

The second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla resemble those of the female. The maxilliped (fig. 24) is elongated and 4-segmented, assuming that the proximal half of the claw represents a fourth segment. The second segment bears two setae, one naked, the other barbed, and a row of spinules. The claw is 180 μ along its axis, shows a division about midway, and bears proximally two very unequal setae, the larger one finely barbed distally.

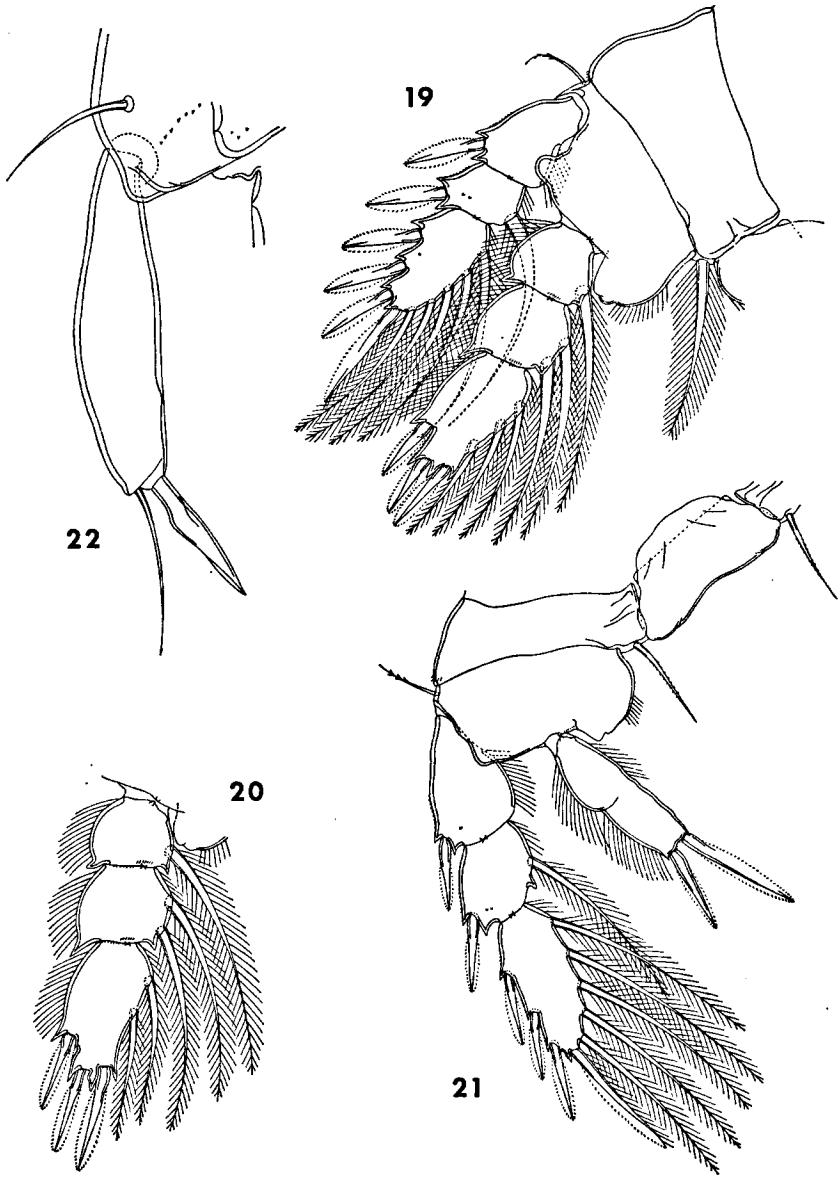
Legs 1 to 4 are segmented as in the female and have similar armature and ornamentation, except for leg 1 where the last segment of the endopod (fig. 25) shows sexual dimorphism, its formula being I,I,4, instead of I,5 as in the female.

Leg 5 (fig. 26) is smaller than in the female, its free segment being 53 × 17 μ, with the terminal seta 50 μ and the spine 40 μ.

Leg 6 (fig. 27) consists of a posteroventral flap on the genital segment, bearing two naked setae 53 μ and 60 μ and a small spiniform process about 8 μ.

The spermatophore was not observed.

The color in life is similar to that of the female.



FIGURES 19—22. *Sewellochiron fidens* n. gen., n. sp., female. 19, leg 2, anterior (F); 20, endopod of leg 3, anterior (F); 21, leg 4 and intercoxal plate, anterior (F); 22, leg 5, dorsal (G).

(The specific name *fidens*, from Latin = fearless, alludes to the presence of this copepod on a medusa which is said to include small crustaceans in its food).

Discussion

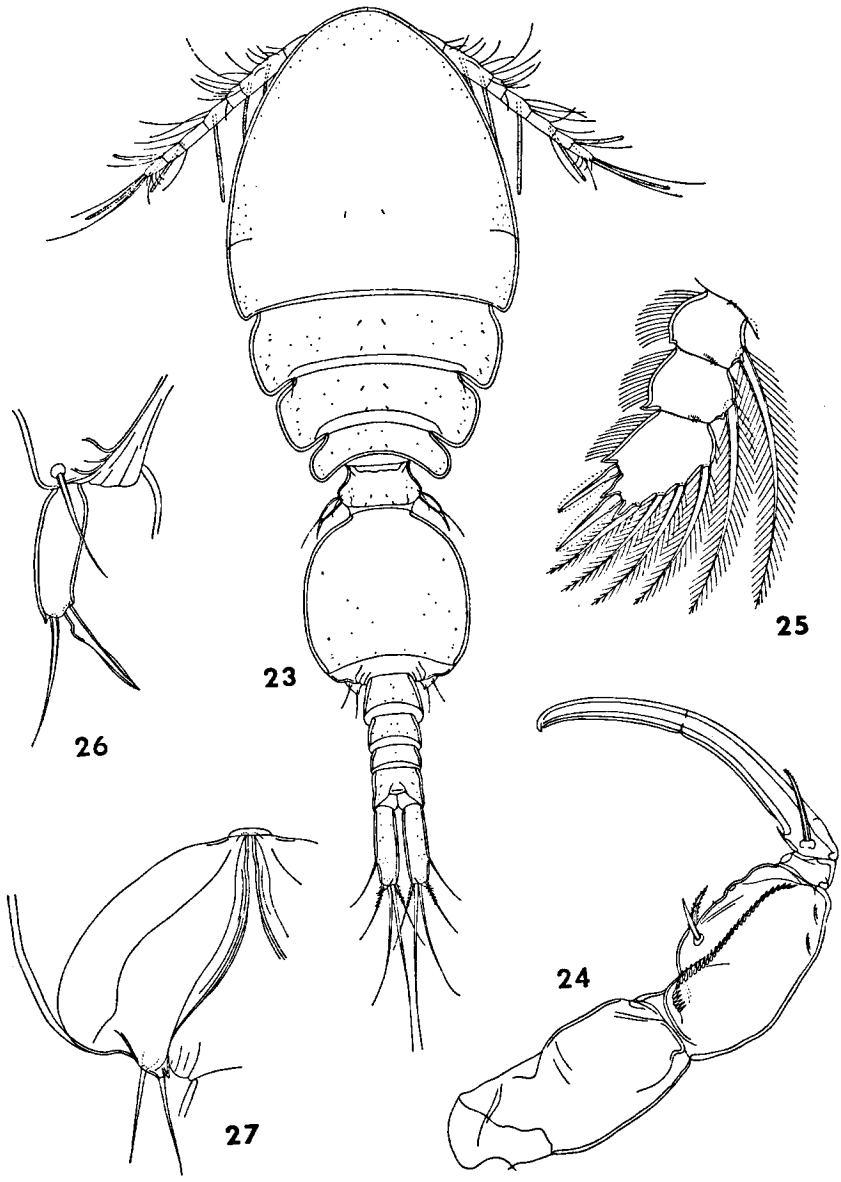
The new genus is close to *Paramacrochiron* Sewell, 1949, and *Pseudomacrochiron* Reddiah, 1969. *Paramacrochiron* was proposed by Sewell as a subgenus of *Macrochiron* Brady, 1872, to include those species with the endopod of leg 4 composed of a single segment. Of the five species which he placed in *Paramacrochiron*, only one, *P. maximum* (Thompson & A. Scott, 1903) properly belongs there, as Stock (1957) has pointed out. The rest belong in other genera. Thus, *Pseudanthessius chelifer* Thompson & A. Scott, 1903, is *Macrochiron cheliferum* (Thompson & A. Scott, 1903). *Pseudanthessius parvus* A. Scott, 1909, *Macrochiron malayense* Sewell, 1949, and *Macrochiron ornatum* Krishnaswamy, 1952, have been placed in *Pseudomacrochiron*, along with *Pseudomacrochiron stocki* Reddiah, 1969. To this genus *Pseudanthessius fucicolus* T. Scott, 1912, should perhaps be added.

Reddiah (1968) has given a diagnosis of the genus *Paramacrochiron*, and included in it the type species, *P. maximum* (Thompson & A. Scott, 1903). and his three new species, *P. ennorense*, *P. sewelli*, and *P. rhizostomae*.

Sewellochiron differs from *Paramacrochiron* mainly in its 3-segmented second antenna, in the formula III,I,5 (instead of II,I,5 as in *Paramacrochiron*) for the last segment of the exopod of leg 4, and in the endopod of leg 4 in the female being much shorter than the exopod (ratio 1 : 2.24).

The new genus differs also from *Macrochiron* Brady, 1872, which has a pointed or needlelike tip on the rostrum, the last segment of the 3-segmented second antenna with either two pectinate claws or one pectinate claw and one clawlike seta, the maxilliped of the female often geniculate with the first and second segments usually elongated, and the endopod of leg 4 a single segment, a weakly divided segment, or 2-segmented.

Sewellochiron differs from *Pseudomacrochiron* which has a 4-segmented second antenna with two claws, lacks paragnaths, and has an armature of II,I,5 on the last segment of the exopod of leg 4.



FIGURES 23—27. *Sewellochiron fidens* n. gen., n. sp., male. 23, dorsal (B); 24, maxilliped, inner (D); 25, endopod of leg 1, anterior (D); 26, leg 5, dorsal (G); 27, leg 6, ventral (D).

The distinctions among *Sewellochiron, Paramacrochiron, Pseudomacrochiron*, and *Macrochiron* may be summarized as follows:

	Sewellochiron	*Paramacrochiron*	*Pseudomacrochiron*	*Macrochiron*
Number of segments in A_2	3	4	4	3
Claws on last segment of A_2	1 claw	1 claw	2 claws	2 pectinate claws, or 1 such claw and 1 clawlike seta
Rostrum	rounded rather than pointed	undescribed	rounded ?	pointed or needlelike
Formula of last segment P_4 exp	III,I,5	II,I,5	II,I,5	II,I,5 or III,I,5
Number of segments in P_4 enp	1	1	1	1 or 2
Length of P_4 enp of ♀ in relation to exp	much shorter than exp, ratio 1 : 2.24	nearly as long as exp	much shorter than exp	much shorter than exp

The copepods associated with medusae may be listed as follows:

Nitocra medusaea Humes, 1953 from *Aurelia* sp., New Hampshire

Paramacrochiron ennorense Reddiah, 1968 from unidentified medusae, Madras, India

Paramacrochiron sewelli Reddiah, 1968 from *Lychnorhiza malayensis* Stiasny, Madras

Paramacrochiron rhizostomae Reddiah, 1968 from *Rhizostoma* sp., Gulf of Manaar, India

Pseudomacrochiron stocki Reddiah, 1969 from *Dactylometra quinquicirrha* L. Agassiz, Madras

Sewellochiron fidens n. sp. from *Cassiopea xamachana* R. P. Bigelow, Puerto Rico.

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